FINAL REPORT

19970446

WESTERN BEEF DEVELOPMENT CENTRE

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AFIF Project # – 19970446

Abstracts and Attachments

1. Whole Farm Cost of Production Program

The Western Beef Development Centre (WBDC) has been involved with the Whole Farm Cost of Production Program through AFIF over the past three years. This program involves a working relationship with Saskatchewan Agriculture and Food and AIMS to collect Cost of Production data from Livestock operations in Saskatchewan. Producer reports were generated for each of the participating Cow-Calf producers. In addition, the information has been used as an extension tool in a variety of ways, which include:

- Benchmark information for the annual Cow-Calf School, which is conducted by WBDC
- The basis for four articles in the January issue of the Western Producer magazine
- Benchmark information for all the Sask. Ag & Food extension Agrologists in their extension activities
- And as a source of information for speaking engagements on Cost of Production at three producer meetings in the province.

2. Quality Assurance Program

The WBDC has implemented a Quality Assurance Program as a model for the Industry to demonstrate on farm quality assurance program based on HACCP principles that focus on food safety and carcass quality.

This is an ongoing program and to date the WBDC has been able to implement several components of the program. Current implementation includes:

- Position descriptions and outline of responsibilities for all the Termuende farm employees
- The development of a binder containing Standard Operating Procedures
- A Herd Health program with the Western College of Veterinary medicine
- The use of Cow Sense for electronic record keeping
- And the tracking of the Carcass evaluations of calves raised at the Termuende farm.

The WBDC staff also provided information on the Quality Assurance program and how it is being implemented to all the producers who attended the June Field Day. The WBDC also hosted a "Quality Starts Here" demonstration for producers at the Termuende Farm on February 14, 2001.

3. Yield and Economics of Winter Corn Grazing

Interest in silage corn varieties for late fall and winter grazing led the WBDC to evaluate different varieties in 2001. Nine varieties of grazing corn were established at the Termuende Research Farm to evaluate plant establishment, input costs, production and forage quality for mature bred females during the fall and winter months. A Field Day was held on October 16, 2001 involving approximately seventy-five (75) producers to see the various varieties and to hear presentations by WBDC staff and the representatives from the participating seed companies. A Fact sheet was generated after the grazing trial was complete (attached) which provided the results of the project. The project was very successful in 2001 as one hundred and fifty (150) Black Angus cows grazed fifty-four (54) acres of corn for thirty-six (36) days and gained on average 2lbs/day. This indicates corn grazing can be used as an economical crop for fall and winter grazing if growing conditions are favourable.

4. Research Community Outputs on Beef Production

'Research Community Outputs on Beef Production' is a multi-year and multi-tasked project to contact, collect, organize, document and post a comprehensive collection of institutions, organizations, research facilities,

researchers and related studies within the area of beef research. This project will focus on past and current programs across all Canadian and northern U.S. state research centres. Within three years the information will be made available potentially in a hard copy and an electronic format to the research community, beef industry funding agencies and extension personnel. This project will involve collaboration with the Canadian Agri-Food Council (CARC) office and the existing database currently on the CARC website known as the Inventory of Agri-Food Research (ICAR). This database is a collection of numerous commodities within Canadian agricultural research. Unfortunately, as it relates to ongoing beef research in Canada the BEEF commodity within this database is not comprehensive or complete. The shortfall of ICAR is a voluntary reporting system by researchers or institutions.

A collection and documentation of ongoing BEEF related research has been started with WBDC staff attending the Western Nutrition Conference, Saskatoon, SK., National Beef Science Seminar, Lethbridge, AB. and the Range Beef Cow Symposium, Casper, Wyoming, U.S.A.

5. Management of Bloat-Safe and Bloat-Reduced Legumes

In 2001, the WBDC initiated a grazing project to demonstrate the establishment and production of non-bloat and bloat-reduced legumes. Yield and quality were measured to determine if these forage legumes perform under commercial cow/calf grazing practices. Twelve acres each of sainfoin (c.v. Nova) (8lb/acre), cicer milkvetch (c.v. Oxley) (18lb/acre) and AC Grazeland Br (8lb/acre) were seeded on May 24/2000. Liquid fertilizer was coulter applied at a rate of 30 lb P/acre. Forage establishment success was evaluated in mid-July 2000 (Table 1) with plant counts conducted within each forage species. Forage legumes were grazed with production measures including forage yield and animal performance. Persistence within the stand of all three-legume species will be monitored over time.

Table 1. Establishment of Forage Legumes

	Plants (ft^2)
Sainfoin (cv. Nova)	7.5
Cicer milkvetch (cv. Oxley)	2.4
Alfalfa (cv. AC Grazeland Br)	15.6

In 2001, the cicer milkvetch pasture was not grazed but managed for weed control. In the summer of 2001, legumes were grazed by cow-

calf pairs using electric fencing for rotational management. Yield estimates are reported in Table 2.

Table 2. Production of Forage Legumes

	Dry matter yield (lb/ac)	Dry matter yield (T/ac)
Sainfoin (cv. Nova)	3630	1.8
Cicer milkvetch (cv. Oxley)	-	-
Alfalfa (cv. AC Grazeland Br)	2350	1.2

Sixty-four cow-calf pairs grazed the twelve acres of sainfoin late June for a total of 32 animal grazing days (AGD) per acre. The twelve acres of alfalfa also produced 32 AGD per acre.

6. Comparison of Annual Pasture Cereals

A demonstration project was conducted to evaluate the production and performance of forage oat varieties, winter wheat, winter triticale and fall rye seeded mid-May with barley cross-seeded and harvested for greenfeed in mid-July. Grazing of cereals will begin in mid-August. Rainfall was limiting during the spring and summer of 2001, with the Lanigan area receiving less than five inches of rain between April 1 and September 15. Due to the drought situation forage production was significantly reduced compared to historic yields.

Soil tests indicated sufficient levels of nitrogen and phosphorous due to heavy manuring the previous year. Five acres of each forage oat variety were seeded on May 15, 2001 with a 15-foot John Deere no-till drill. Prior to seeding, weed control was managed using Roundup Transorb®, applied May 9, at a rate of 1.5 L/ac. On June 12, 2001, Buctril-M was also sprayed at a rate of 0.36 L/ac. Twelve acres each of winter wheat, winter triticale and fall rye were seeded May 17 at 1.5 bushel/acre.

Forage production data was collected on July 24, prior to grazing by beef cows. Dry matter yield was estimated by clipping five 0.25 m^2 quadrats from each variety plot area. Forage samples were then dried for 72 hours, weighed and are reported in Table 3. CDC BELL averaged only 1300 lb/ac or 0.65 tons per acre and CDC BALER averaged 1030 lb/ac or 0.52 tons per acre.

Table 3. Dry matter yield of cereal varieties

	KG/HA	LB/AC	TON/AC
CDC BELL OATS	1456	1300	0.65
CDC BALER OATS	1150	1030	0.52
WINTER WHEAT	1020	910	0.46
WINTER TRITICALE	1056	942	0.47
FALL RYE	1011	902	0.45

7. Weed Control in Forages

A problem with establishing new forages is the control of broadleaf and grassy weeds. The challenge is to control weeds without reducing the productivity of the established forage. Another initiative is the long-term control of Absinth wormwood. The objective of this project is to determine the efficacy of GRAZON® herbicide to eliminate Absinth wormwood in a long established Gray Luvisolic.

Grazon Demonstration

GRAZON® was applied on 13 acres for use as a product demonstration by WBDC in 2001. Recommended rate for GRAZON® is 1.5L/ac or 3.5L/ha. One case (20 L) treats 13.3 acres. Target weeds include Canada thistle, tansy, absinth wormwood and western snowberry (buckbrush) (not currently labeled). GRAZON® should be applied as a foliar application with a minimum water volume of 10 gallons/acre. Strip trials were applied by ground equipment. Application was June 15, when plants were most actively growing, and full leaf surface has emerged. The majority of the Canada thistle population had emerged before spraying. Targeting absinth wormwood will be an exception; this weed starts early and can be sprayed earlier (May 15 - June 15). Be sure to target absinth when it is actively growing in its most vegetative state; it will begin to harden off as the weather turns hotter and dryer.

Strip trials were set up as a side-by-side comparison of the following treatments.

Untreated
2, 4-D LV 600 at 1.5 L/acre (600 ml/acre is the highest labeled pasture rate for Canada Thistle and similar to the rate of 2,4D that is in GRAZON®; you may adjust this to actual local field use rate)
Untreated
GRAZON® @ 1.5 L/acre (3.5 L/ha) on Absinth wormwood
Untreated
GRAZON® @ 2.0 L/acre (5.0 L/ha)* on Absinth wormwood (25% increase)

* GRAZON® activity on Absinth wormood at 1.25 X rate because there is a possibility that if the wormwood has hardened off, it will be harder to control. Validation as to whether there is justification in increasing the rate to get better control.

GRAZON® and 2,4 D LV activity will be monitored and measured in spring 2002 as to control of Absinth wormwood in Gray Luvisolic pasture.

8. 2000 Saskatchewan Cow-Calf Costs and Returns

Saskatchewan Agriculture and Food, and the Western Beef Development Centre are completing the Whole Farm Costs of Production Program. There are two primary reasons why the program was initiated in Saskatchewan. The first is to assist interested cow-calf producers in determining their costs and returns. The project calculates the costs and returns for the whole farm, as separated into the various enterprises that exist on their operation. The second reason for the project is to generate some provincial benchmarks for costs of production that can be used by Agrologists and interested individuals.

It is a well-known fact that for any business to be profitable, managers must have a good handle on what it costs them to produce their product. They also need to know how their costs and returns compare to similar operations. To effectively manage your operation, you must get a handle on these two factors. This project allows people that participate to do both. While we can't say the numbers generated are the average for the entire province, they still provide you with a basis for comparison with your own herd.

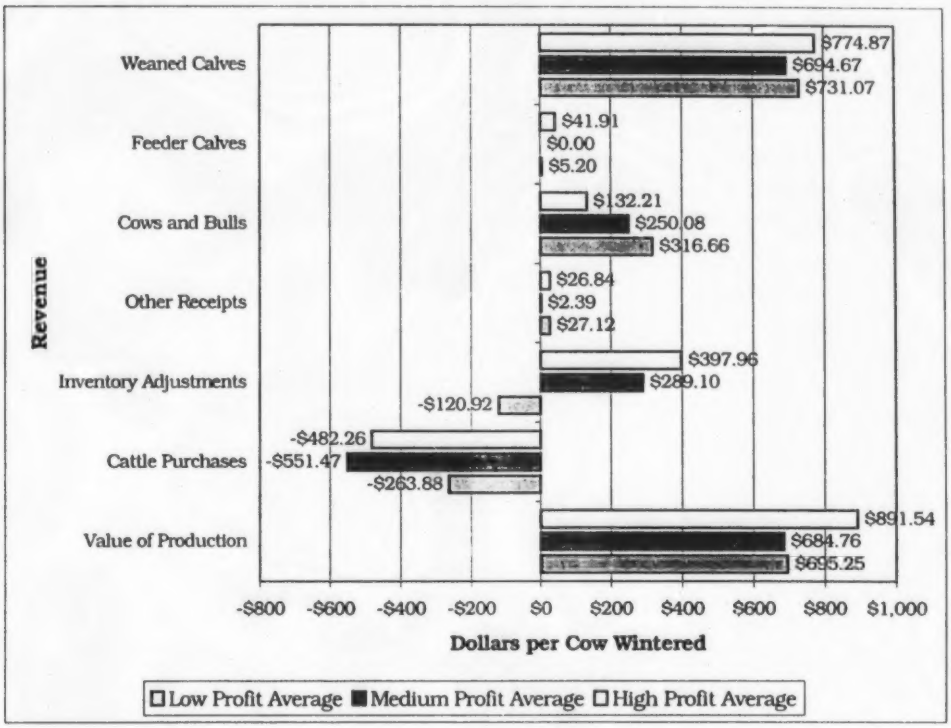
So what makes an operation profitable? The profits are either from a *high value of production* or a *low cost of production* (or some combination of the two). What is it for cow-calf enterprises? First lets look at the value of production. Figure 1 below presents the value of production for three different groups of cow-calf enterprises. This information has been separated into three operations: those with profits less than $100 per cow wintered (low profit), those with profits of between $100 and $200 per cow wintered (medium profit), and those with over $200 profit per cow wintered (high profit).

The first thing that we notice in Figure 1 is that the value of production per cow – which includes all revenue from the cow-calf enterprise – is much

higher for high profit herds. The primary source of revenue for each enterprise is weaned calf sales, which is expected. It is interesting to note though, that adjustments to inventories and cull cow sales make up a significant portion of the total revenue generated by the cow-calf

enterprise. In 2000, the average value of production for high profit herds was $897.54 per wintered cow. For medium profit herds, the average value was $684.76, while it was $695.25 per cow wintered for low profit producers.

Figure 1 Cow-calf Enterprise Value of Production, Low Profit, Medium Profit and High Profit Beef Herds, Saskatchewan, 2000



We often focus our attention on cow-calf costs of production – because producers have a greater ability to manage these factors. Figure 2 below shows that there is a significant difference in the costs of production for the three herd types. The differences in the costs of production show up in only a few major areas. The areas that create the biggest difference between the highest profit herds and the lowest profit herds are: 1) unpaid labour, and 2) costs associated with capital investments, and 3) feed costs.

While unpaid labour can be a confusing, it's best to think of it as family living withdrawals taken out of the cow-calf enterprise in exchange for work. This cost was estimated at $111 per cow wintered for low profit producers in 2000, while the costs for high profit producers averaged $45

per cow. This means a difference of $66 per cow, and is due to economies of size in the large operations.

The second area is the costs associated with maintaining capital assets. This includes depreciation of the assets, long-term interest, machinery and building operating costs (fuel and utilities), and the machinery and building repair costs. One of the difficult things to do when calculating costs of production is getting a good handle on how much each asset is devoted to each farm enterprise. This project gets the producers to estimate what percentage of each asset goes towards each enterprise (cow-calf vs. forage vs. grain vs. pasture).

This allocation allows us to do an economic analysis on each enterprise the farm is involved in (forage enterprise, pasture enterprise, grain enterprise and cow-calf enterprise). These costs totaled $138.22 for the high profit herds, and $141.83 for the low profit herds.

It is interesting to note that in previous years, while there are large differences between the winter feed and bedding costs for the high and low profit producers, and the costs of pasture between the high and low profit producers, there is not a large difference between these costs when totaled for the cow. In 2000, these costs were significantly higher for the low profit herds versus the low profit herds ($332 versus $238).

Cow-calf production remains one of the few bright spots in western Canadian agriculture. The challenge for producers in the next few years will be to ensure that they continue to aggressively manage their costs of production. If cow-calf production is a means for producers to maintain a given way of living, they must be willing to look at it as a competitive business that "earns" a return for investors.

The average investment per cow for all herds in 2000 was $1865. This included the value of the cow and all equipment, buildings, and machinery that were allocated to the cow-calf enterprise. Using this investment allows us to make some general comments on how these three herd sizes are performing financially. The return on investment of an operation gives a snapshot of how it is performing that can be compared to other investments such as mutual funds or savings bonds. The high profit herds had a return on investment of 19.31% in 2000. Operations with medium profits had a return on investment of 8.66%, while low profit herds had a return on investment of –0.47%. The average return on investment for all herds was 11.29%, so the question becomes, are these rates of return acceptable to producers in the most profitable period of the cattle cycle? Should producers be happy if their rates of return are similar to these and their enterprise is "average", especially when producers are making 19%?

The program has been ongoing for four years, and it has shown some interesting developments. Over the time period, the cattle cycle has been on the upswing – prices have been increasing every year. If we look at the profitability of these operations, we also see that profits have been increasing, as we expect. The worrisome trend that is developing is that the costs of production have also been increasing. This could cause problems in the future as the cycle peaks and prices begin to fall.

In summary, the difference in the cost of production, which appears to be the primary factor affecting profits, is most affected by unpaid labour and the costs of maintaining capital assets. These costs make up 35% of the difference between the high profit herds and the low profit herds. The most profitable herds appear fairly healthy. These enterprises may only require some small "tweaking" to further enhance the profits in their business. The low profit herds need to aggressively manage their costs in order to stay profitable. These benchmark costs of production can be used as a guide to help them in their management decisions.

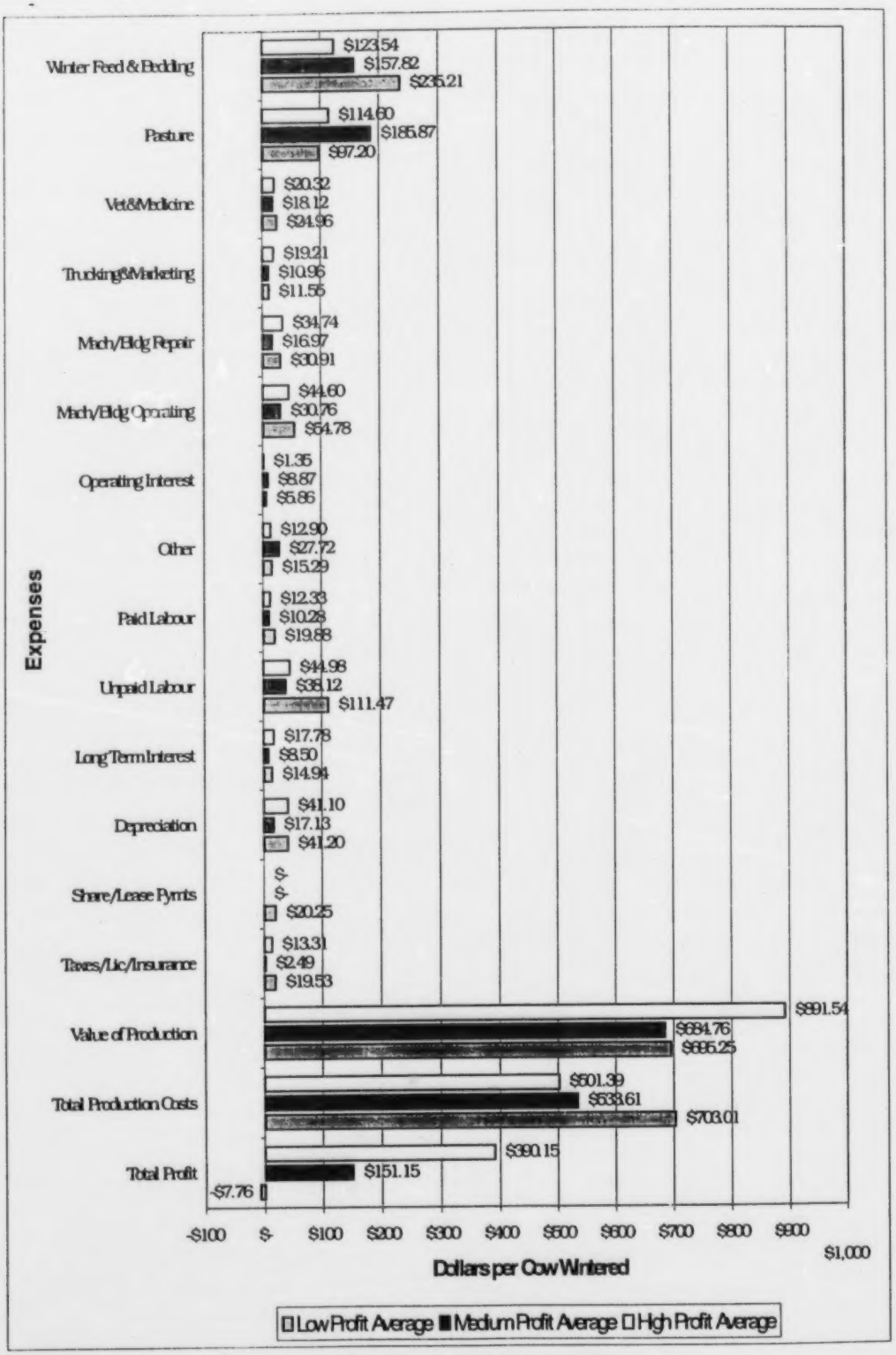


Figure 2 Cow-calf Enterprise Costs of Production, Saskatchewan, 2000

9. Comparing your cow herd's economic condition

Our last article dealt with determining the costs and returns for your cow-calf enterprise. In this article we'll discuss how your operation compares with other producers. Costs and returns information has been gathered from participating producers across Saskatchewan. This information has been separated into three profit categories, low profit, medium profit and high profit herds. Once you have calculated your costs and returns you can compare your information and see how your herd compares with these producers. The tables below have separated the costs and returns in the same manner as we calculated your information in the last article.

Table 1 shows the average gross revenue for the three groups of producers. We see a large difference in the returns for the three groups. There are only two ways to explain this difference. The high profit producers have larger herds. They average 192 cows wintered as compared to 92 cows wintered for the low profit herds. The second reason has to be marketing, which is related to being a larger herd. These producers probably spend more time marketing the calves because they are more significant portion of their farm income, and larger groups of calves often attract better prices – particularly if they are uniform.

Table 1. Average Returns for Low, Medium, and High Profit Herds
Average Return ($/lb of Calf Weaned)
Gross Income

	Low Profit Herds	Med. Profit Herds	High Profit Herds	Your farm
Weaned Calves	$1.26	$1.28	$1.35	_____
Cows & Bulls	$0.24	$0.29	$0.36	_____
Other Receipts	$0.03	$0.01	$0.04	_____
Inventory Adjustments	$0.25	$0.19	$0.34	_____
Less: Cattle purchases	-$0.54	-$0.40	-$0.55	_____
GROSS INCOME	$1.24	$1.37	$1.54	_____

The second part of the profitability question is the costs of feeding for the cow-calf enterprise. Table 2 presents the average costs of the three producer classes. When looking at the costs in Table 2, the first issue is the difference in the winter costs between the high and low profit producers. The low profit producers use an extra 8 cents per pound of calf weaned for winter feed and bedding costs. This extra 8 cents means about $40 per 500 pounds of calf weaned. Feed costs are one of the largest components of total costs of production and can have a large impact on the profitability of an enterprise. It is interesting to note that there is little difference in the costs of pasture for the high and low profit herds.

Table 2. Average Feed Costs for Low, Medium, and High Profit Herds
Average Feeds Costs ($/lb of Calf Weaned)
Feed Costs

	Low Profit Herds	Medium Profit Herds	High Profit Herds	Your Farm
Winter Feed & Bedding	$0.38	$0.33	$0.30	_____
Pasture	$0.25	$0.30	$0.23	_____
TOTAL FEED COSTS	$0.63	$0.63	$0.53	_____

Table 3 shows the average variable or livestock costs of the three classes of producers. There are only three categories that need to be mentioned. Repair costs for buildings and machinery, operating costs for buildings and machinery, and labour costs of the enterprise. All three of these are at least twice as high for the low profit herds as they are for the high profit herds. The difference in these three categories account for 27 cents per pound of calf weaned between the two groups. This represents 29% of the total costs of production of the high profit herds – in just three areas. What's so special about these categories? Two things. First, the repairs and operating costs are directly related to the overhead and capital that a producer has invested in his/her operation. Second, these costs are not really affected by the number of cows that the producer maintains in the herd.

The low profit producers have one of two things wrong with their cow-calf enterprise – they have too much overhead, or they have too few cows. It's that simple.

Table 3. Average Variable Costs for Low, Medium, and High Profit Herds
Average Variable Costs ($1/lb of Calf Weaned)

	Low Profit Herds	Medium Profit Herds	High Profit Herds	Your Farm
Vet & Medicine	$0.05	$0.04	$0.04	_____
Trucking & Marketing	$0.02	$0.02	$0.02	_____
Mach/Bldg Repair	$0.08	$0.04	$0.03	_____
Mach/Bldg Operating	$0.11	$0.07	$0.05	_____
Operating Interest	$0.00	$0.01	$0.01	_____
Other	$0.05	$0.02	$0.02	_____
Paid Labour	$0.02	$0.02	$0.02	_____
Unpaid Labour	$0.26	$0.11	$0.10	_____
TOTAL VARIABLE	$0.59	$0.33	$0.29	_____

The final cost category we look at is the fixed or overhead costs for the enterprise. The major cost component in this category is depreciation. Table 4 shows that it twice as high for the low profit herds as it is for the high profit herds.

Table 4. Average Fixed Costs for Low, Medium and High Profit Herds
Average Fixed Costs ($/lb of Calf Weaned)

	Low Profit Herds	Medium Profit Herds	High Profit Herds	Your Farm
Long Term Interest	$0.04	$0.00	$0.02	_____
Depreciation	$0.08	$0.06	$0.04	_____
Share/Lease	$0.03	$0.02	$0.03	_____
Taxes/Lic/Insurance	$0.02	$0.02	$0.01	_____
TOTAL FIXED	$0.17	$0.13	$0.10	_____

Table 5 puts all the information together to show the overall profitability of the three classes of enterprises. The profits for the high profit herds are 77 cents per pound of calf weaned higher. There are six main areas that make up this difference: gross revenue, winter feed costs, machinery and building operating costs, machinery and building repair costs, labour, and depreciation.

Table 5. Average Costs and Returns for Low, Medium, and High Profit Herds
Average Return ($/lb of Calf Weaned)

	Low Profit Herds	Medium Profit Herds	High Profit Herds	Your Farm
GROSS REVENUE	$1.24	$1.37	$1.54	_____
TOTAL FEED COSTS	$0.63	$0.63	$0.53	_____
TOTAL VARIABLE	$0.59	$0.33	$0.29	_____
TOTAL FIXED COST	$0.17	$0.13	$0.10	_____
TOTAL PROFIT	-$0.15	$0.27	$0.62	_____

By putting your information in the space provided you should get some idea of where your herd is in terms of profitability. While these numbers are not provincial averages, and the key areas may not apply to your enterprise, this information is a useful starting point in the actual evaluation of your cow-calf enterprise. If you're having trouble making a profit the six categories mentioned should be the first place you start looking for problems.

In our final article, we'll look at some analysis tools that can help producers determine how their cow-calf enterprise is doing.

10. Standard Operating Procedures - Contents

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   Appendix 1.1 CCIA Bulletin "Dead Stock"

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   - 2.2 Cow/calf Vaccination Program
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   - 2.5 Dead Animals

   Appendix 2.1 Cow/calf Vaccination Protocol
   Appendix 2.2 Cow/calf Treatment Protocol

3. Animal Health Products
   - 3.1 Animal Health Product Use
   - 3.2 Animal Health Product Inventory and Storage

4. Animal Welfare
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   - 4.2 Animal Handling and Facilities
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   - 4.4 Culling Criteria
   - 4.5 Marketing Cull Animals
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   - 4.7 On-Farm Salvage and Emergency Slaughter
   - 4.8 Euthanasia

   Appendix 4.1 Recommended Code of Practice for the Care and Handling of Farm Animals – Beef Cattle
   Appendix 4.2 Recommended Code of Practice for the Care and Handling of Farm Animals – Transportation
   Appendix 4.3 Canadian Council on Animal Care – September 2000 Assessment Report
   Appendix 4.4 University Committee on Animal Care and Supply (UCACS) – Assurance of Animal Care Forms
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5. Feeding
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B. OCCUPATIONAL HEALTH AND SAFETY

C. HUMAN RESOURCE POLICIES

11. Record Keeping Systems

- Records are initially recorded by hand and then transferred to computer spreadsheets and databases

11.1 Animal Inventory

- The Herdsperson is responsible for updating and verifying the herd records
- Herd records include: breeding, pregnancy check results, calving records, weaning records, weights and BCS (body condition scores), deaths, necropsies, sales and purchases
- Herd records are updated each time an entry occurs
- A receiving log is kept to record the verified source, date and description of all purchased animals
- History records are requested on all stock purchased. This information is entered into the herd records for these animals
- History records, including genetic, performance and treatment records, on all animals sold are sent to buyers
- Culling records include date culled, animal ID, reason for culling, selling price, and selling destination
- CCIA tag numbers are recorded within the herd inventory when an animal is culled or dies
- Animal inventory is verified each time cattle are worked (i.e., vaccination, weighing, preg checking)
- Cattle in pens are checked and counted daily
- Pasture checks are conducted daily to ensure animal health and access to water and feed. Any problems are noted to the specific animal(s) and recorded in a pocket book carried by each staff member. All pocket book records are consolidated and recorded in the main herd inventory
- Pasture checks include a weekly head count verified with the herd inventory
- Animals are counted at each pasture move
- Animals are counted *on* and *off* transport trucks. Counts are verified against a copy of the herd inventory record provided to the truck driver and transferred to the receiving Herdsperson

11.2 Processing and Treatment Records

- All processing and treatments (individual animal and mass medications) are recorded including vaccinations, medications (injectable, feed, water) and other treatments (i.e. parasite control, implants)
- Processing records include: date, animal identification, products administered, dosage, route of administration, withdrawal period and processing crew members
- All treatments (both individual and mass treatments) are initially recorded by the staff member performing the treatment on a treatment sheet located in the drug room. If treatment occurs while on pasture, the treatment is initially

recorded in the individual's pocket book and then transferred to the sheet posted in the drug room. Treatment records are transferred to the herd records on a weekly basis

- Treatment records include: animal identification, date treated, disease/condition, product administered, dosage, administration route, withdrawal person and person who treated the animal
- Staff sign off on all tasks performed according to treatment and processing protocols

11.3 Animal Health Product Inventory

- An animal health product inventory is maintained by the Herdsperson
- Inventory includes quantity of products on hand, lot and serial numbers purchase date, expiration date and all treatment records of product used
- Use of animal health products for individual treatments will be recorded on treatment sheet posted in drug room
- Mass treatments and use of products when processing cattle will be entered directly into product inventory
- Individual treatment records will entered into product inventory **weekly**
- Inventory records will be reconciled with physical inventory on a **monthly** basis.
- All expired products will be disposed of when monthly inventory occurs
- Product orders will be submitted **four times per year** (January 1st, April 1st, July 1st, October 1st)
- A binder is located in the drug room containing label inserts of all products in inventory
- Any vet prescriptions for off-label use are kept on record with the product inventory

11.4 Feed Supply Inventory

- An **annual feed inventory** is kept (fiscal year April 1st – March 31st) as part of the record keeping system
- The feed inventory contains a separate sheet for each type of feedstuff (i.e. greenfeed, grass/alfalfa hay, pellets, grain, minerals)
- At the **end of each month** the inventory is updated based upon **daily feed sheets**
- Feed ustilization is tracked by pen daily, including cows, bulls, and each lot of backgrounders. Quantities are recorded as number of bales, tonnes of grain or pellets, or bags of mineral.
- A **receiving log** is kept for all incoming purchased feed. Record is maintained of quantity received, description, date received, source and price
- Samples of incoming feeds are submitted for nutrient analysis. (One sample submitted for each feed type. Grain and pellets are sampled when the first load is received. Additional samples are submitted on a monthly basis). A copy of each feed report is kept on file with the feed inventory.

- A copy of all feed tags (including guaranteed analysis) is kept on file with the feed inventory

11.5 Feeding Records

- Feed consumption per pen (or group of animals) is recorded on a daily basis including feed type and quantity, identification of animals and number of head per pen
- Daily feed sheets are totaled at the end of each month with totals entered into the feed supply inventory
- A copy of all daily feed sheets is maintained on file with the feed inventory

11.6 Grazing Records

- Grazing records are maintained by the Herdsperson for all animals for the duration of the grazing season
- Records include: identification of pasture grazed, number and identification of animals in each grazing field, date turned into field, date removed from field
- A copy of all grazing records is forwarded to the Forage and Beef Specialist at the end of the grazing season or at intervals as requested
- Grazing records specific to a research or demonstration project are outlined in individual project protocol

11.7 Weather Records

- Daily temperature and precipitation records are maintained at Termuende Research Farm on a year round basis and at Pathlow Pasture during the grazing season

11.8 Equipment Use and Maintenance

- Hours of use are recorded on a daily basis by the Senior Farm Hand for each individual piece of equipment
- Allocation of equipment use is divided between the cow/calf and backgrounding operations at Termuende Research Farm
- A logbook of regular equipment maintenance is maintained by the Senior Farm Hand with information on each individual piece of equipment updated at the time of maintenance

12. COMPARISON OF GRAZING CORN VARIETIES

Introduction

Continued interest in silage corn varieties for late fall and winter grazing led the Western Beef Development Centre to evaluate different varieties in 2001. Nine varieties of grazing corn (Table 1) were established at Termuende Research Farm, near Lanigan, Saskatchewan to evaluate plant establishment, input costs, production and forage quality for mature, bred cows grazing during the fall or winter months.

Seeding

Eight corn varieties (Hyland, Pioneer, Super Leafy Silage and Canamaize) were seeded on 24 acres where grazing corn was grown the previous year (Section 22, Field 7). Monsanto's Roundup Ready corn was also direct-seeded on 30 acres south of this corn project area (oat swath grazing area in 2000). All varieties were seeded May 15, 2001 once soil temperatures reached 10° Celsius. Seeding rates were based upon recommendations for each variety (see specific variety management factors in Table 1) and seeded at 1" depth. Corn was sod-seeded using a 15 ft. John Deere no-till press drill (runs blocked to achieve wider row spacing than 7 ½"). All varieties were seeded at 30-inch row spacing except Canamaize, which was seeded at 8-inch row spacing.

Fertility

Soil samples were taken April 26, 2001 to evaluate residual fertility levels and to determine appropriate levels of fertilizer application (based upon recommendations). Soil tests indicated nutrient levels were 134 lbs N/acre, 80 lbs P/acre, 1200 lbs K/acre and 96 lbs S/acre for the eight varieties. Soil tests for the 30 acres of Roundup Ready corn indicated 70 lbs N/acre, 90 lbs P/acre, 1080 lbs K/acre and 86 lbs S/acre. Tests indicated elevated levels of soil nutrients due to heavy fertilization in 2000. Additional fertilizer was coulter applied prior to seeding May 15th for only two varieties. The Super Leafy Silage variety from Gold Country Seeds received 50 lb N/acre and the Roundup Ready corn received an additional 30 lb N/acre.

Table 1. Silage Corn Varieties

VARIETY	HEAT UNITS	SEEDING RATE (seeds/acre)	AREA(acres)
Super Leafy Silage	2200	30,000	6
Hyland 2007	2100	30,000	2
Hyland 2428	2100 - 2250	30,000	2
Hyland 2093	2200 - 2350	30,000	2
Pioneer 39M27	2200 - 2350	30,000	2
Pioneer PB85	2175	30,000	2
Pioneer 39W54	2150	30,000	2
Canamaize	2100	60,000	7.5
RR DKC27-11	2250	30,000	30

Weed Control

Weed species present included wild oats, round-leaved mallow, redroot pigweed, wild buckwheat, foxtail barley, green foxtail, Russian thistle and kochia. The field (24 acres) where Super Leafy Silage, Pioneer, Hyland and Canamaize varieties were seeded received Atrazine 480 (1.0 L/ac) on May 9, 2001, which was then incorporated with a cultivator. Buctril-M at 0.36 L/ac was applied June 12th for additional control of broad leaf weeds. Weed control on the Round Up Ready corn was achieved with Roundup Transorb (glyphosate). Roundup was applied June 9 (0.33 L/ac) and August 7 (0.5 L/ac), 2001. Specific variety recommendations are for 1.0 L/acre.

Costs

Input costs (Table 2) are calculated according to custom application and equipment rental rates. It is important to note that costs will vary for each operation and need to be calculated according to each producer's individual situation.

Table 2. Input costs ($/acre)

	Canamaize	Super Leafy Silage	Hyland	Pioneer	Roundup Ready
Field Prep	5.00	5.00	5.00	5.00	5.00
Fertilizer	0	15.00*	0	0	9.00*
Herbicide	15.93	15.93	15.93	15.93	12.95
Fencing	3.73	3.73	3.73	3.73	3.73
Seeding	15.00	15.00	15.00	15.00	15.00
Seed	27.50	46.87	40.00	42.00	65.62
TOTAL	67.16	101.53	79.66	81.66	111.30

*Fertilizer costs based upon spring application with value of fertilizer calculated at $0.30/lb actual nitrogen. No fertilizer applied on Canamaize, Hyland or Pioneer varieties due to residual nitrogen level (134 lb N/ac) according to soil test in 2001 (assuming two years of nutrient value).

Results

Yield estimates were completed on all nine varieties on September 27, 2001. These results have been summarized in Table 3. Yields ranged from 4.5 to 9.7 wet tons per acre for 2001, greater than in 1999 or 2000. Moisture content averaged 40% for Canamaize and 70% for Super Leafy Silage, Hyland, Pioneer and Roundup Ready. This improved performance may be due to early seeding of the crop, good weed control in the first four to six weeks, and sufficient heat units (CHU) during the growing season. Long-term average is 1900 heat units for the Lanigan area. Calculated heat units from May 1 to September 30, 2001 at the research farm were 2700 CHU's.

All varieties had very good cob development with differing stages of maturity (Table 4). Hyland and Canamaize corn plants had the most mature cobs with 58% at kernel dent and 73% hard kernel, respectively.

Table 3. Production and quality of corn varieties (September, 2001)

VARIETY	LB/AC	T/AC Wet	T/AC Dry	Protein (%)	TDN* (%)	DE** (Mcal/kg)	ADF*** (%)
Super Leafy	19456	9.73	2.92	8.85	71.39	3.13	25.51
Hyland 2007	18885	9.44	2.85	8.74	63.87	2.78	32.55
Hyland 2428	16518	8.26	2.48	10.43	68.48	3.00	28.23
Hyland 2093	15908	7.95	2.39	6.64	53.15	2.34	42.57
Pioneer 39M27	15380	7.69	2.31	11.70	67.55	2.95	29.10
Pioneer PB85	17819	8.91	2.67	10.08	57.37	2.51	38.62
Pioneer 39W54	16273	8.14	2.44	10.88	75.27	3.31	21.87
Canamaize	12907	6.45	3.77	8.77	65.62	2.87	30.91
RR DKC27-11	9022	4.51	1.35	10.24	65.78	2.87	30.76

*TDN = Total digestible nutrients **DE = Digestible Energy ***ADF = Acid detergent fibre

Table 4. Plant establishment and cob development of nine corn varieties (September, 2001)

	Plants/Acre	Cob Stage (%)			
		1	2	3	4
Super Leafy Silage	28,586	57	39	4	0
Hyland 2007	32,126	37	27	32	4
Hyland 2428	37,843	73	26	0	1
Hyland 2093	31,037	33	9	58	0
Pioneer 39M27	33,215	22	30	1	29
Pioneer PB85	25592	27	50	13	10
Pioneer 39W54	36482	60	25	13	2
Canamaize	53906	12	8	7	73
RR DKC27-11	27497	47	52	1	0

Stage of maturity; 1=immature, 2=milk, 3=kernel dent, 4=hard kernel

Grazing Results

Electric fencing was used to control access to corn varieties and monitor utilization of the available crop. Grazing of corn varieties began on October 11 and was completed by November 17, 2001, a total of thirty-six days. One hundred fifty one Black Angus cows, with an average weight of 1150 lbs, had controlled access to corn varieties. Cow numbers have been presented as Animal Units (1 AU= a 1000 lb cow) to account for differences in cow weight between grazing trials. Due to the small acreage of some varieties, the three Hyland varieties were grazed at one time, as were the Pioneer varieties. Grazing dates, grazing days per acre and costs are presented in Table 5.

Table 5. Corn grazing results (2001)

	Total acres	Grazing days	Animal Units	Grazing days/acre	$/AU/day
Super Leafy Silage	6	6 days	174	174	$0.58
Hyland Varieties	6	6 days	174	174	$0.46
Pioneer Varieties	6	6 days	174	174	$0.47
Canamaize	7.5	6 days	174	139	$0.48
RR DKC27-11	30	12 days	174	83	$1.34

The greatest numbers of grazing days per acre were obtained with Hyland and Pioneer varieties at 174 AGD/acre. These varieties yielded from 7.7 to 9.7 tons per acre but more importantly had advanced plant maturity with cobs at the dent or hard kernel stage. It is important that corn reach full cob development prior to grazing thus providing sufficient crop density which will translate into maximum grazing days per acre.

Cob production and maturity on Canamaize was good and contributed to the number of grazing days obtained, however trampling and feed wastage were noted on this variety. Reduced rates of glyphosate for weed control on the Roundup Ready variety resulted in reduced yield and animal grazing days of the crop.

Animal Performance

On average cows entering the corn plots and at the end of the study maintained a body condition score of 3.0. Average cow weight was 1150 lbs prior to grazing the corn and 1215 lbs coming off the study with an average gain of 65 lbs per animal.

Economics

How does this production translate into returns for producers? The costs per animal unit (1000 lb cow) per day for the nine corn varieties are shown in Table 5. Costs per AU/day ranged from $0.46 to $1.34 for the Hyland and Roundup Ready varieties, respectively. Due to high soil nutrient levels in this study based on soil tests, additional fertilizer was not applied. Even with an expense of $30/acre for fertilizer, cost/cow/day would only increase $0.70 to $0.76 across all corn varieties. Calculated costs involving swath grazed barley and oat varieties at Termuende Research Farm in 2000 worked out to $1.00/AU/day.

Conclusion

Early maturing silage type corn varieties can provide excellent late season grazing, in the year of establishment and into the following year as well. The role for grazing corn can be a flexible late fall or winter crop to balance off with existing winter graze options. It is important to control animal access to the crop with electric fencing. This will improve utilization of the crop while reducing trampling and wastage. In years of heavy snowfall, cattle may have better access to standing corn in comparison to swathed crops under the snow.

With multiple inputs of seed, herbicide, fertilizer and fencing it is important to maximize the full potential of silage corn varieties to extend the winter grazing period. Intensive grazing of grazing corn can also provide adequate returns for producers. The key to successfully maximize profits is to manage costs effectively.

Thank you to project contributors:

- **Pioneer Hi-Bred**
- **PrairieSeeds (Hyland Seeds)**
- **Canamaize Seed Inc.**
- **Monsanto Canada Inc.**
- **Gold Country Seed**